©Hohe Tauern National Park; download unter www.biologiezentrum.at

Conference Volume | **5th Symposium for Research in Protected Areas** 10 to 12 June 2013, Mittersill | pages 155 - 158

Living forests and dead wood

Saproxylic beetle communities in two suspected virgin forest areas in the Nationalpark Kalkalpen (Upper Austria)

Andreas Eckelt

Abstract

The saproxylic beetle fauna of two forest areas ("Kohlersgraben" and "Zwielauf") was studied during the vegetation period 2010. Both investigation sites are dominated by mixed beech-fir-spruce forest. The results obtained were used for an ecological- and faunistic evaluation of the two investigation sites. Approximately 3500 individual specimens were collected. They all belong to 438 different beetle species, of which 242 are saproxylic beetle species. Among those there are thirteen relict species of virgin forests. These thirteen species present a strong indication for a long habitat tradition in the two forest areas. All xylobiont beetles are divided into substratum-guilds (SCHMIDL&BUßLER2004) to enable a comparison with different natural forest reserves.

Keywords

saproxylic beetles, xylobiont beetles, relict species, virgin forests, National Park Kalkalpen, Upper Austria

Introduction

Xylobiont* (or saproxylic) species are one of the most critically endangered organism groups (STOKLAND et al. 2012). Xylobiont and phytophagous organisms play a very important role in the structural development of forest areas. Xylobiont beetles are very crucial for wood decomposition and thereby also in soil development processes (MÖLLER 2009).For such enormous meaningful species natural habitats or at least habitats without nearly any visible anthropogenic influence, are in Austria minimised to only a few thousand hectares (probably less than 1% of the nation area). There are very limited sites left where it is possible to study the original native fauna as it once used to be way back .A large part of the forests in the national park area experienced a huge silvicultural utilisation during the last centuries and only a hand full of small places remained almost untouched. These few places are one of the last regions in Upper Austria where it is possible to study a potentially natural xylobiont beetle community.

The main goals of the study has been to carry out an enquiry of the deadwood dependent beetle community composition in order to conduct a faunistic-ecological evaluation of the study areas applying xylobiont beetles as indicator group. Furthermore to perform an endangerment analysis of the encountered beetle community and providing well founded fundamental data for future comparative studies.

Study Areas

The supposed primeval forest areas of Zwielauf (54,6ha) and Kohlersgraben (30,6 ha) are both dominated by mixed beech-fir-spruce forest. In Zwielauf the dispersal of conifers and broadleaf trees are more or less equal. In the area Kohlersgraben the broadleaf trees are more abundant. Both areas show a great amount of dead wood in divers structural stages (Fig. 1). The area Kohlersgraben is situated between the upper collin and lower montane stage (600-800m), whilst Zwielauf lays in the upper montane region (1200-1400m).

Methods

To give a good overview of the range of the species, additional trap methods (window-, pitfall- and light traps) as well as the traditional manual sampling techniques were used during the vegetation period in 2010. All beetles were determinated to specie's level using the standard literature of Freude, Harde & Lohse –"Die Käfer Mitteleuropas". To provide a good quality of the determined material, all species which were tough to identify, also got checked up by using the great beetle collections of the natural science departments of the Tyrolean State Museum and the University of Innsbruck.

*The definition for xylobiont beetles follows SCHMIDL & BUßLER (2004): xylobiont are all species which reproduce and spend the most of their lifespan obligatorily in and on any kind of wood in all various kind of decay stages, including wood inhabiting fungis.

©Hohe Tauern National Park; download unter www.biologiezentrum.at

Figure 1: Habitat pictures of the two study areas. Zwielauf (left) andKohlersgraben (right). (Photos A. Eckelt)

Results

Approximately 3500 individual specimens were caught, all belonging to 438 different beetle species out of 60 families overall, of which 242 are xylobiont beetle species (Fig. 2). Among these 242 beetle species there are thirteen relict species (MÜLLER et al. 2005) of virgin forests (Kohlersgraben 10 spp. and Zwielauf 7 spp.). These thirteen species (Tab. 2) present a strong indication for a long habitat tradition in the two forest areas. All xylobiont beetles are divided into substrate guilds (see SCHMIDL & BUßLER 2004) to enable a comparison with different natural forest reserves. The substrate guild composition of the two sites differ in the guilds of the inhabitants of fresh dead wood (f - guild) and the inhabitants fungi on deadwood or fungi-infested deadwood (p–guild). In Zwielauf the f–species are stronger represented, whereas in Kohlersgraben the p–species show a higher representation rate. The other guilds hardly show any difference in the frequence of appearance (Tab. 1).

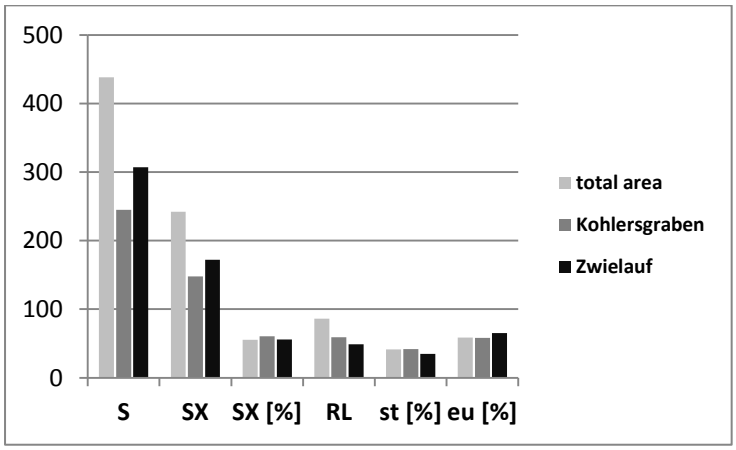

Figure 2: Overview to the results of the study.S = Species, SX = xylobiont Beetles, SX [%] = percentage xylobiont Beetles, RL = Red List Species, st [%] = percentage stenotopxylobiont Species, eu [%] = percentage eurytopxylobiont Species

Both sites share shortly 25% of the species range. This result shows a great difference in the beetle community structure of the investigation areas. Additionally, 86 red list species were identified and mapped, indicating that around 20% of the entire species assemblage is in some way endangered. Among saproxylic beetles, 24 % are considered red list species. In the investigation area Zwielauf, 49 red list species, and in the site Kohlersgraben, 59 red list species, have been recorded.

All detected xylobiont beetles are analyzed for their potential as appropriate indicators of natural forests. There were 126 species identified as potential indicators for natural forests. Among them, 70 are weak indicators, 41 are good indicators and 15 are considered strong indicators for potential natural forests without any anthropogenic influence (Fig. 4). As Figure 3 shows, the amount of high and good indicators for nativeness is slightly higher in the research area Kohlersgraben than in the one of Zwielauf.

Another highlight for the so far for the park unknown FFH – Species *Cucujuscinnaberinus* (Scopoli, 1763)(Code: 1086; Annex II & IV of the FFH-Directive), was located in both study areas. Together with *Rosaliaalpina* (Linnaeus 1758) and *Stephanopachyssubstriatus* (Paykull, 1800), as well a FFH-Directive species, there are now three known FFH-Species in the national park.

©Hohe Tauern National Park; download unter www.biologiezentrum.at

Table 1: Percentages of substrate guilds composition overall and within the red list species. a = inhabitants of old rotten deadwood in a variety of conditions, f = inhabitants of fresh dead wood, m = inhabitants of rot-holes, p = inhabitants fungi on deadwood or fungi-infested deadwood, s = species using deadwood in other ways, n = species number, RL% = percentage of red list species within the xylobiont spectrum. (following SCHMIDL & BUßLER 2004)

Substrate - Guilds			
	ZWI [%]	KOH [%]	GF [%]
a	39,5	37,2	39,5
f	33,1	27,7	29
m	0,6	0,7	1
p	25,6	31,1	27,5
s	1,2	3,4	3
n	172	148	242
Red List Species			
a	35,9	37,3	37,1
f	15,4	9,8	12,9
m	0	2,0	1,4
p	48,7	43,1	42,9
s	0	7,8	5,7
n	39	51	70
RL %	22,7	34,5	28,9

Discussion

Surprisingly the two investigation areas only share 25% of the detected species range. This fact could be based on the different altitudes of the sites as well as on the higher rate of conifers and the more open forest structure in Zwielauf. Within the substrate guilds the percentage of freshwood inhabiting species (f) is higher in Zwielauf as in the area Kohlersgraben. The situation within the inhabitants of xylobiont fungi (p) is reverse. These matters of facts could be explained with the following reasons: a.) In Zwielauf, a few years ago, a storm caused several wind thrown trees as well as damages on still standing trees in the area. This means more potential habitats for fresh dead wood inhabiting species. b.) The highly closed canopy structure in the area Kohlersgraben generates a more balanced humidity within the stock. A constant humid microclimate provides a perfect habitat for many different wood and tree inhabiting fungi species. This might be the most likely reason for the higher percentage of p-guild members in the area. The very short survey period of only one summer season is enough for a first small insight, but it is not adequate for a reasonably entirely enquiry of the real xylobiont beetle community. Therefore one would need at least two or better several years of fieldwork to establish more precise study results. Nevertheless it was possible to highlight the meaning of those forest areas in nature conservation efforts for the national park as well as for entire Upper Austria.

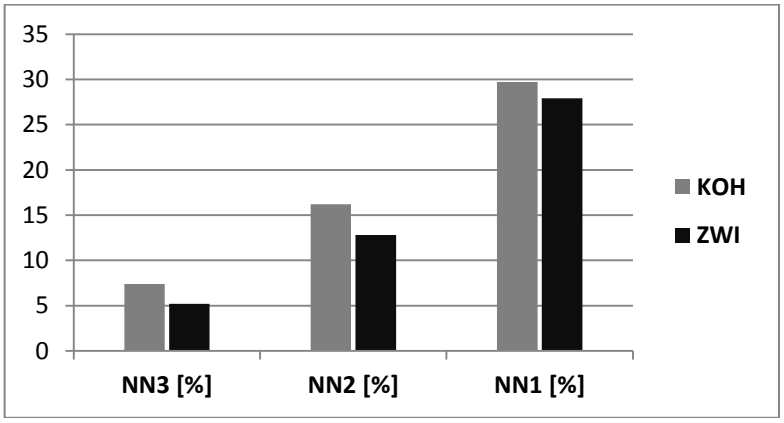

Figure 3: NN = indicator of nativeness, NN3 = high indication, NN2, good indication, NN1 low indication, KOH = study area Kohlersgraben, ZWI = study area Zwielauf
Table 2:Urwaldrelict species and their occurrence in the investigation sites Kohlersgraben (KOH) and Zwielauf (ZWI).

Conclusion

The examined potential virgin forest areas are from crucial importance - both local and nationwide - for nature conservation. The results of the study prove the largely nativeness of the study areas as well as their potentials as dispensing fields for a resettlement of the surrounding areas with the aboriginal beetle fauna. The highly specialized way of living and their very sensitive reaction of environmental changes in their habitats, makes xylobiont beetles an ecological key group for several different queries in the context of forest ecosystem research and conservation.

©Hohe Tauern National Park; download unter www.biologiezentrum.at

Table 2: Urwald relict species and their occurrence in the investigation sites Kohlersgraben (KOH) and Zwielauf (ZWI).

Urwald relictspecies	KOH	ZWI
Peltisgrossa	+	-
Calitysscabra	+	-
Ampedusauripes	-	+
Nematodesfilum	+	-
Pediacusdermestoides	+	+
Synchitaseparanda	+	-
Xestobiumaustriacum	-	+
Dolotarsuslividus	+	+
Neomidahaemorrhoidalis	+	+
Ceruchuschrysomelinus	+	+
Tragosomadepsarium	+	-
Rosalia alpina	+	-
Rhyncolussculpturatus	-	+

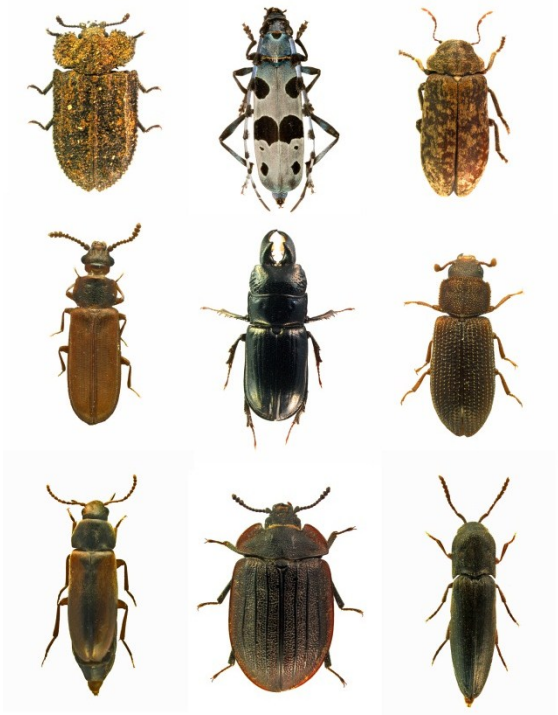

Figure 4: A small selection of characteristic species of natural forests. *Calitysscabra, Rosaliaalpina, Xestobiumaustriacum, Pediacusdermestoides, Ceruchuschrysomelinus, Synchitaseparanda, Dolotarsuslividus, Peltisgrossa* and *Nematodes filum* (f.l.t.r).

References

MÖLLER, G. 2009. Struktur- und Substratbindung Holzbewohnender Insekten, Schwerpunkt Coleoptera. Dissertation Freie Universität Berlin.

MÜLLER, J., BUßLER, H., BENSE, U., BRUSTEL, H., FLECHTNER, G., FOWLES, A., KAHLEN, M., MÖLLER, G., MÜHLE, H., SCHMIDL, J., ZABRANSKY, P. 2005. Urwald relict species – Saproxylic beetles indicating structural qualities and habitat tradition. Waldökologie online, Heft 2. 106-113.

SCHMIDL, J., BUßLER, H. 2004. Ökologische Gilden xylobionter Käfer Deutschlands. Naturschutz und Landschaftsplanung 36.p. 202-217.

STOKLAND, J. N., SIITONEN, J. & B. G. JONSSON 2012. Biodiversity in dead wood. – Ecology, biodiversity, and conservation. Cambridge University Press. 509 pp.

Contact

Andreas Eckelt
a.eckelt@tiroler-landesmuseen.at

Tiroler Landesmuseen-Betriebsgesellschaft m.b.H.
Naturwissenschaftliche Sammlungen
Feldstraße 11a
6020 Innsbruck
Austria
Tel.: +43 512 59489-426

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: Nationalpark Hohe Tauern - Conference Volume

Jahr/Year: 2013

Band/Volume: 5

Autor(en)/Author(s): Eckelt Andreas

Artikel/Article: Living forests and dead wood. Saproxylic beetle communities in two suspected virgin forest areas in the Nationalpark Kalkalpen (Upper Austria). 155-158